

ANNUAL REPORT 1965

ORANGEVILLE

water pollution control plant

LIBRARY COPY

JUN 3 1966

ON WATER
RESOURCES COMMISSION

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca



ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Orangeville Local Advisory Committee,
Town of Orangeville.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Orangeville Water Pollution Control Plant, OWRC Project No. 58-S-16.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

A handwritten signature in dark ink, appearing to read "D. S. Caverly", is written over the typed name.

D. S. Caverly,
General Manager.



ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Orangeville Water Pollution Control Plant, OWRC Project No. 58-S-16.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

A handwritten signature in cursive script, reading "B. C. Palmer".

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

C O N T E N T S

Foreword	1
Title Page	3
'65 Review	4
Glossary	5
History	6
Project Staff	7
Description of Project	8
Project Costs	10
Plant Flow Chart	13
Design Data	14
Process Data	17

ORANGEVILLE
water pollution control plant

operated for

THE TOWN OF ORANGEVILLE

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

COMMISSIONERS

W. D. Conklin, Q.C. H. E. Brown
D. A. Moodie L. E. Venchiarutti

GENERAL MANAGER: D. S. Caverly

ASSISTANT GENERAL MANAGERS

L. E. Owers K. H. Sharpe
F. A. Voegelé A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street Toronto 5

'65 **REVIEW**

Operation of the Orangeville Water Pollution Control Plant for 1965 proceeded without major difficulty.

High quality effluent was impossible to obtain as plant loading, in terms of pounds of BOD per day and flow, was greatly in excess of the treatment capacity of the aeration section.

Working conditions were made difficult during times of high flow, particularly storm flows, when large amounts of grit came into the plant through the storm sewers.

The plant staff adequately handled all difficulties. Although operation from a mechanical view point was excellent, the Credit River is receiving plant effluent of poor quality due to insufficient plant capacity.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY

1956 - 1965

INCEPTION

In October 1956, the Town of Orangeville initiated plans with the Ontario Water Resources Commission for an expansion of their existing water pollution control plant. The firm of Proctor and Redfern of Toronto was engaged to prepare plans and specifications for the project.

APPROVAL

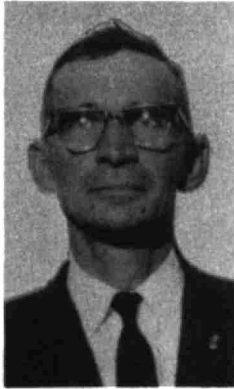
In October 1956, the municipality signed an agreement with the Ontario Water Resources Commission to construct and operate the expanded plant.

CONSTRUCTION

The contract was awarded to the low bidder, Frid Construction Limited and work commenced in August 1959 and was completed December 1960.

TOTAL COST

\$176,332.00

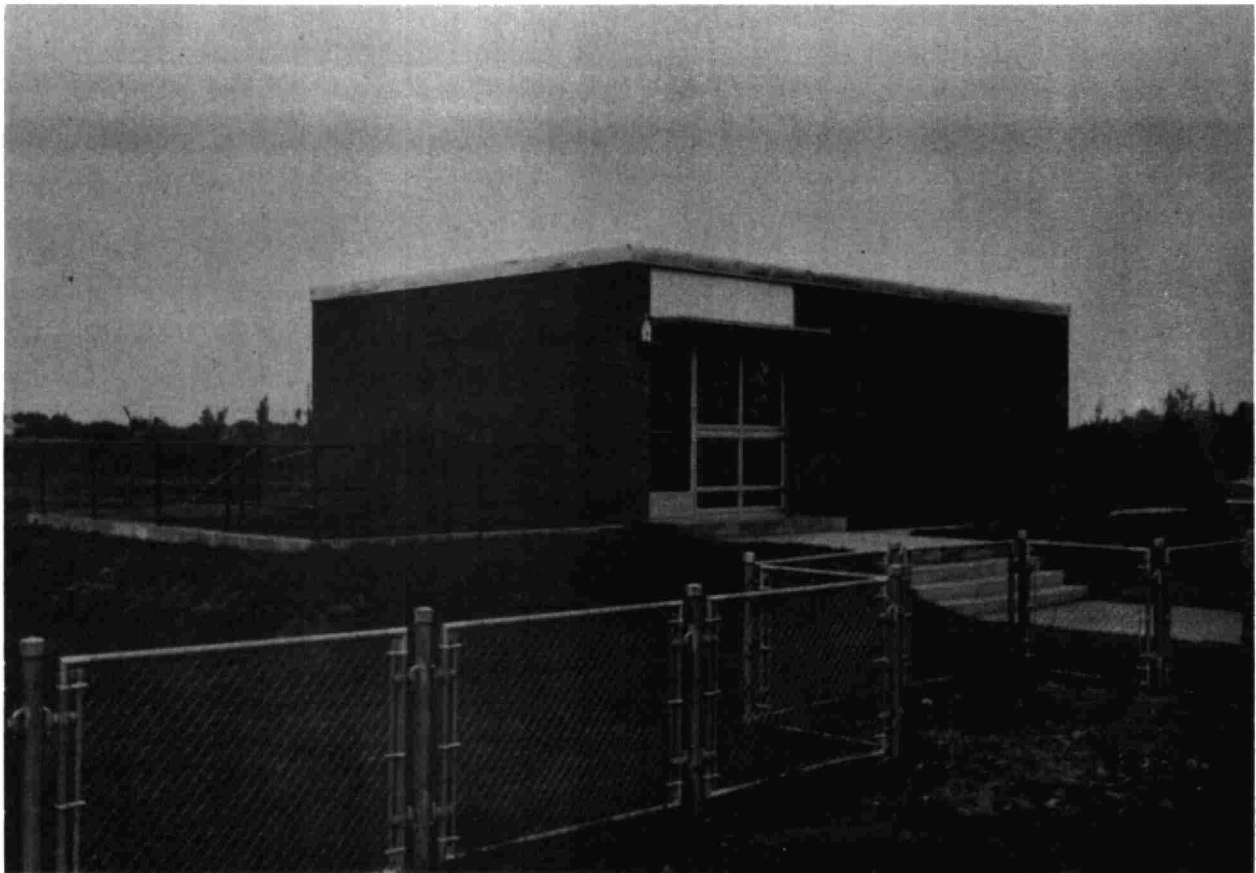


CLARENCE CLARKE

Project Staff

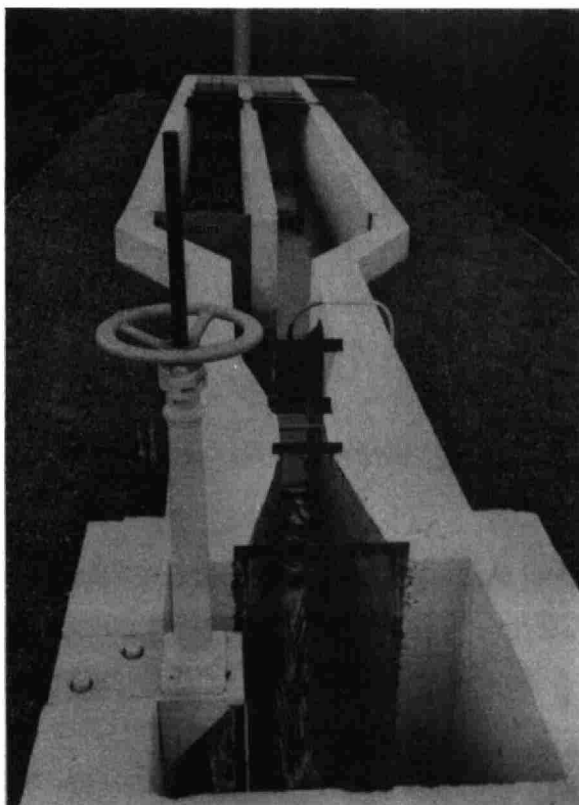
Mr. Clarence Clarke, the Chief Operator at the Orangeville Water Pollution Control Plant joined the Commission in May 1960. He has proved to be an able and conscientious worker and is to be commended for the efficient and economical operation of the plant.

Mr. Clarke has successfully completed the Sewage Operators' Courses offered by the Ontario Water Resources Commission and holds the senior certificate.



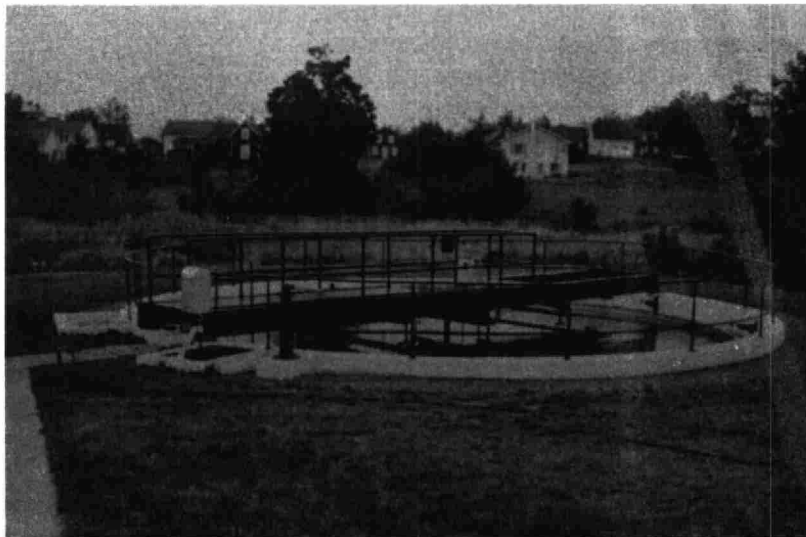
ORANGEVILLE WPCP

**DESCRIPTION
OF
PROJECT**



INFLUENT WORKS

PRIMARY SEDIMENTATION TANK
ALLOWS HEAVIER SOLIDS TO
SETTLE; SURFACE SCUM AND
GREASE ARE ALSO REMOVED.



INFLUENT WORKS

The sewage enters the plant by means of a 30" diameter sewer and is coarse screened to remove large objects which may damage equipment. It is then pumped by two raw sewage lift pumps to a grit channel which reduces the flow velocity sufficiently to allow the grit to settle out.

The raw sewage then flows to the primary sedimentation tank.

PRIMARY SEDIMENTATION TANK

The primary sedimentation tank is designed to provide an adequate detention period to allow the heavier solids to settle out, and for the removal of surface scum and grease. The heavier solids which settle out to the bottom of the tank and surface scum are collected and pumped to a holding tank.

The primary sedimentation tank is designed to provide sufficient detention to allow for the removal of 30-35% of the heavy organic material.

The settled waste water flows over the weir, and is split, 170,000 gallons per day flowing to the aeration tank. The remaining bypasses the plant and is chlorinated and flows to the river.

AERATION TANK

Settled sewage flows from the primary

sedimentation tank to the aeration. There it is mixed with the activated sludge which is returned from the final sedimentation tanks and aerated.

The aeration sections retain the sewage for 6 1/2 hours at a flow of .170 million gallons per day. Air is supplied by two blowers with a total capacity of 460 cubic feet of air per minute.

FINAL SEDIMENTATION TANK

The aerated mixed liquor from the aeration section is retained in the final sedimentation tank for approximately 2.5 hours at a flow of 170,000 gallons. This allows the activated sludge to settle. It is collected from the bottoms of the tanks and returned to the aeration sections. (Excess activated sludge is returned to the primary sedimentation tanks and is pumped from there to the digester.) The remaining liquid flows over the weirs of the final sedimentation tanks to the chlorine contact chambers.

DIGESTION

There is no controlled digestion at this plant. The sludge from the primary and final sedimentation tanks is pumped to a holding tank where it is held prior to disposal by tank truck.

PROJECT COSTS

NET CAPITAL COST (Estimated) (Long Term Debt to OWRC)	<u>\$176,332.46</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	<u>22,908.76</u>
Net Operating	13,525.19
Debt Retirement	3,558.00
Reserve	1,018.74
Interest Charges	9,753.24
TOTAL	<u>27,855.17</u>

RESERVE ACCOUNT

Balance at January 1, 1965	5,091.39
Deposited by Municipality	1,018.74
Interest Earned	<u>303.33</u>
	6,413.46
Less Expenditures	
	-
Balance at December 31, 1965	<u>\$ 6,413.46</u>

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY
JAN	510.98	352.49				139.05	19.44			
FEB	1209.89	345.45		27.81	131.47	139.05	30.54	14.01		521.56
MARCH	1117.72	346.46		45.28	108.65	139.05	67.86		44.91	365.51
APRIL	868.04	449.91			130.15	139.05	33.57			115.36
MAY	1391.05	552.98		24.95	113.64		31.84	5.75	259.93	401.96
JUNE	1274.21	361.94			210.57	278.10	94.09	12.90		316.61
JULY	794.06	365.08			98.81	139.05	63.01	7.11		121.00
AUG	1171.13	358.76			44.55	367.49	49.67	36.00		314.66
SEPT	1256.87	371.40		26.80	102.37		3.80		83.74	668.76
OCT	1038.93	566.58			119.11	327.70			3.83	21.71
NOV	1530.11	378.70			100.85		20.53	190.70	50.92	788.41
DEC	1362.20	368.73		51.28	155.10	417.15	28.83	54.74	10.55	275.82
TOTAL	13525.19	4818.48		176.12	1315.27	2085.69	443.18	321.21	453.88	3911.36

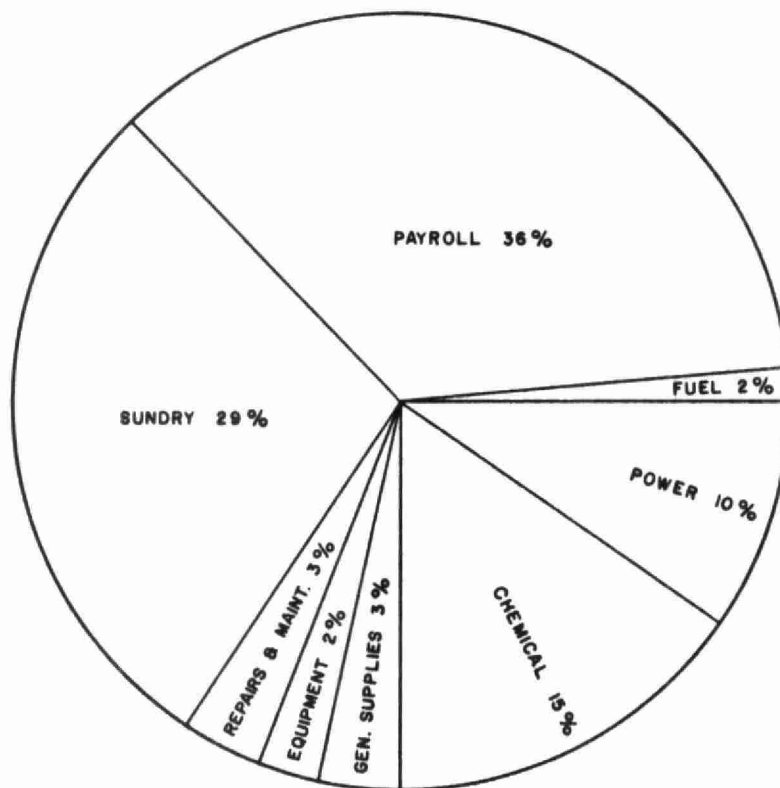
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE \$3525.00
BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

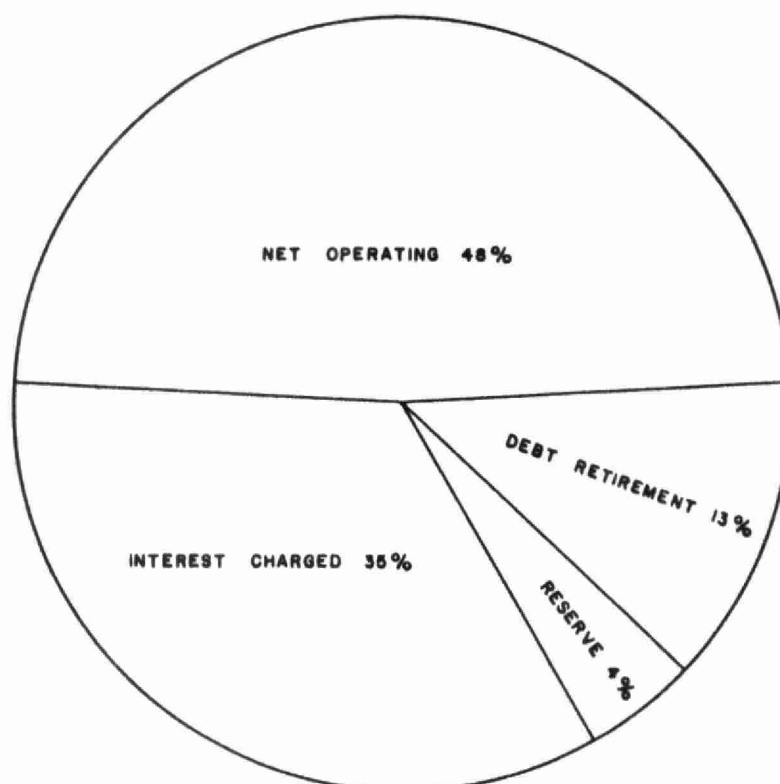
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	168,643	\$ 12992.61	* \$ 10.92	\$ 77.00	
1962	161,630	\$ 10616.07	\$ 8.81	\$ 65.80	4 CENTS
1963	161,545	\$ 13347.87	\$ 10.53	\$ 82.60	7 CENTS
1964	187,373	\$ 13000.89	\$ 9.94	\$ 69.38	8 CENTS
1965	215,853	\$ 13525.19	\$ 10.34	\$ 62.66	6 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1965 OPERATING COSTS

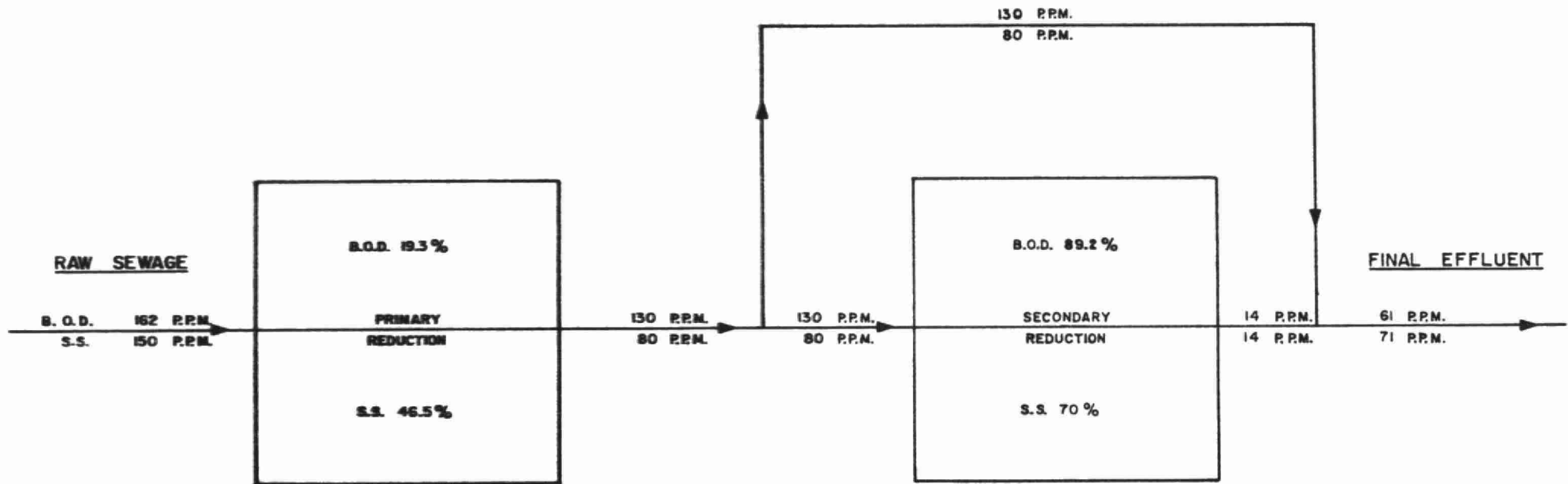


TOTAL ANNUAL COSTS



**Technical
Section**

ORANGEVILLE W.P.C.P.
SCHEMATIC SKETCH SHOWING EFFICIENCIES
OBTAINED BY PRIMARY & SECONDARY UNITS



NOTE: OVERALL PLANT EFFICIENCY

B.O.D.	=	62.5 %
S.S.	=	52.5 %

ABOVE LOADINGS BASED ON AVERAGE OF SAMPLE RESULTS FOR 1965

B.O.D. — RAW SEWAGE 162 P.P.M.
 S.S. — RAW SEWAGE 150 P.P.M.

Design-Data

GENERAL

Type of Plant - Primary treatment, part of effluent is given secondary treatment by the old plant.

Design Population - 7,500 persons

Per Capita Flow - 100 gallons per day.

Design Plant Flow - 750,000 gallons per day.

Five Day BOD -

Raw Sewage - 200 ppm
Removal - 36%

Suspended Solids -

Raw Sewage - 250 ppm
Removal - 60%

INFLUENT WORKS

Inlet to raw sewage pump well.
30 inch diameter sewer pipe.

SCREENING

Coarse Screen (at pump well) - 1960
1.25 in. x 0.25 at 2 inch centres.

Raw Sewage Pump well - 1960
15ft. x 10 ft. x 8 ft. (overflow)
1200 cu. ft. or 7480 gallons.

Retention - 14.4 minutes at design flow
- 750,000 GPD.

LIFT PUMPS

Raw Sewage lift pumps - 1960
2 - Smart-Turner vertical centrifugal pumps each rated at 300 GPM at a head of 20 feet.

Each is driven by a 3 HP General Electric Motor. 1 Smart-Turner vertical centrifugal pump rated at 500 GPM at a head of 25 feet and driven by a 7.5 HP General Electric Motor.

GRIT REMOVAL

Grit Channels - 1960

Screens - 1.25 in. x 0.25 in. at 2 inch centres.

Channels - 2 each 25 ft. x 1.896 feet (top of wall)

Water Depth - 0.366 ft. at 1 fps.

PRIMARY SEDIMENTATION TANKS

Primary Clarifier - 1960

Size - 35 feet diameter by 12 feet deep (S. W. D.)

Capacity - 1520 cu. ft. or 72,000 gallons.

Retention - 2.31 hours at 750,000 GPD.

Surface Settling rate - 780 gals/sq. ft. of surface area/day.

Weir overflow rate - 7,350 gal/lin. ft. of weir/day.

Raw Sludge pump - 1960

1 - Carter plunger type rated at 75 GPM at a head of 15 feet and driven by a 2 HP General Electric Motor.

Division Chamber - 1960

Divides flow to aeration tanks or chlorine contact chamber.

AERATION SECTION

Aeration tanks - 1929

Size - 2 tanks each 84 ft. x 8 ft. x 8 ft. deep.

Capacity - 5380 cu. ft. each or 67,000 gallons total.

Retention - 6.44 hours at 250,000 GPD.

Air blowers - 1929

2 - Babcock-Wilcox and Goldie-McCulloch air blowers each rated at 230 c.f.m. at 10 psig and each driven by a Lancashire Dynamo and Cripto 20 HP electric motor.

Return Sludge pump

1 - Smart-Turner pump rated at 75 GPM at a head of 25 feet and driven by a 1.5 HP General Electric Motor.

FINAL SEDIMENTATION TANK

Final settling tanks

Size - 2 tanks each 14 ft. x 14 ft. x 7.5 ft. deep (average liquid depth).

Capacity - 1520 cu. ft. each or 18,950 gallons.

Surface settling rate - 638 gal/sq. ft. of surface area/day at 250,000 gpd.

Retention - 1.82 hours at 250,000 gal. per day.

Weir overflow rate - 1,300 gal/lin. ft. of weir/day at 250,000 gpd.

CHLORINE CONTACT CHAMBER

Chlorine Contact Chamber - 1960

Size - 29.75 ft. x 12 ft. x 6.92 ft. deep (max. liquid depth)

Capacity - 2470 cu. ft. or 15,400 gal.

Retention - 29.6 minutes at 750,000 gpd.

CHLORINATOR

Chlorinator - 1960

1 - Wallace and Tiernan bell-jar type chlorinator with a maximum rated capacity of 75 pounds of chlorine per day.

MISCELLANEOUS PUMPS

Sump pump in control building.

1 - Jacuzzi Universal submersible sump pump driven by 1/3 HP Jacuzzi Universal electric motor.

Primary Effluent Well Pump

1 - Wemco torque flow pump rated at 150 gpm at a head of 25 feet and driven by a 3 HP General Electric Motor.

Sump pump in old control building.

1 - Kenco Multi-Purpose pump rated at 1000 gpd at a head of 15 feet and driven by a 1/3 HP Kenco electric motor.

1 - Burgess-Manning Pen Flowmeter with totalizing, indicating and recording attachments.

SLUDGE HOLDING TANK

Size - 18.5 ft. diameter x 15 ft. deep

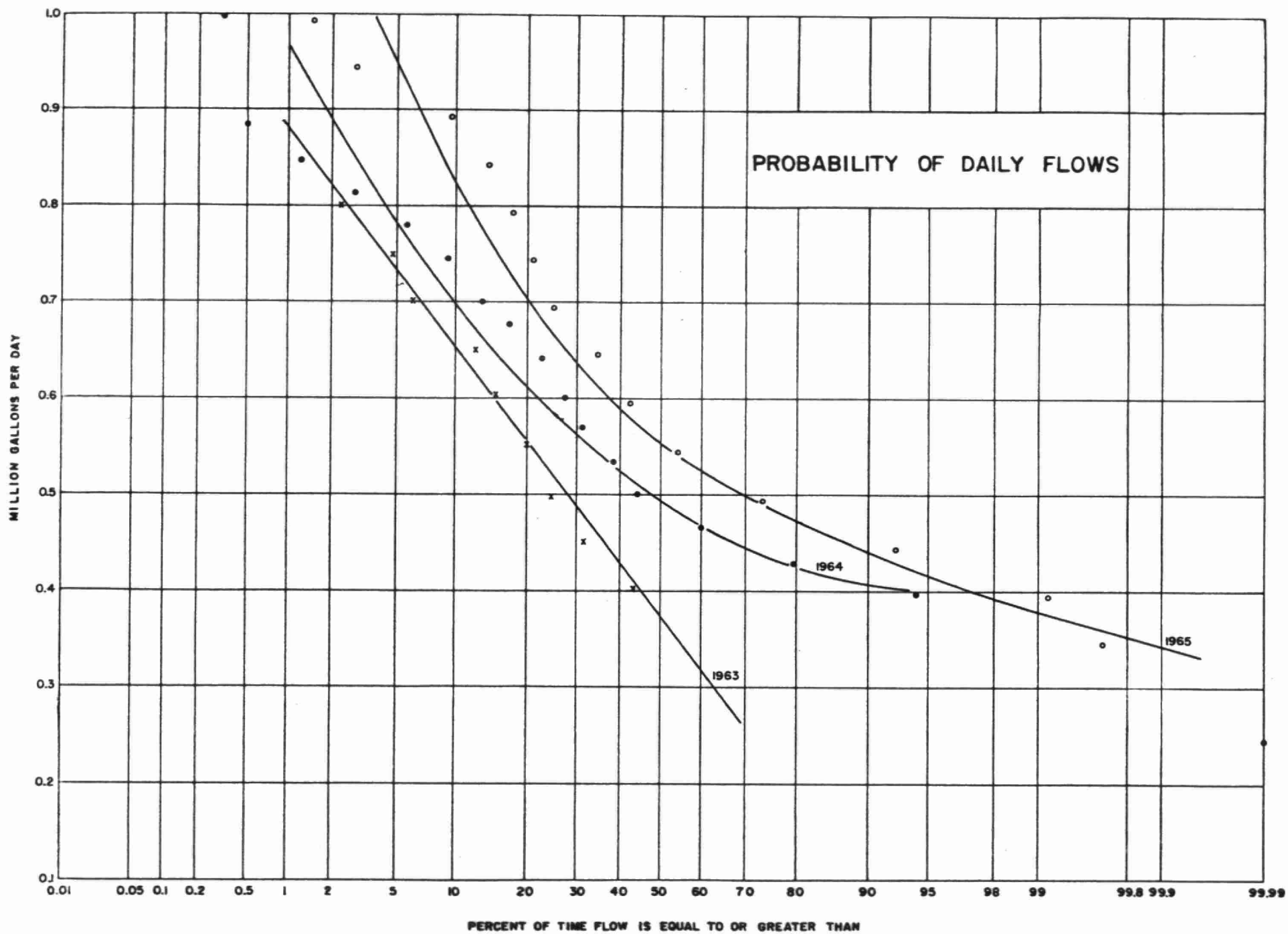
Capacity - 4030 cu. ft. or 25,125 gallons.

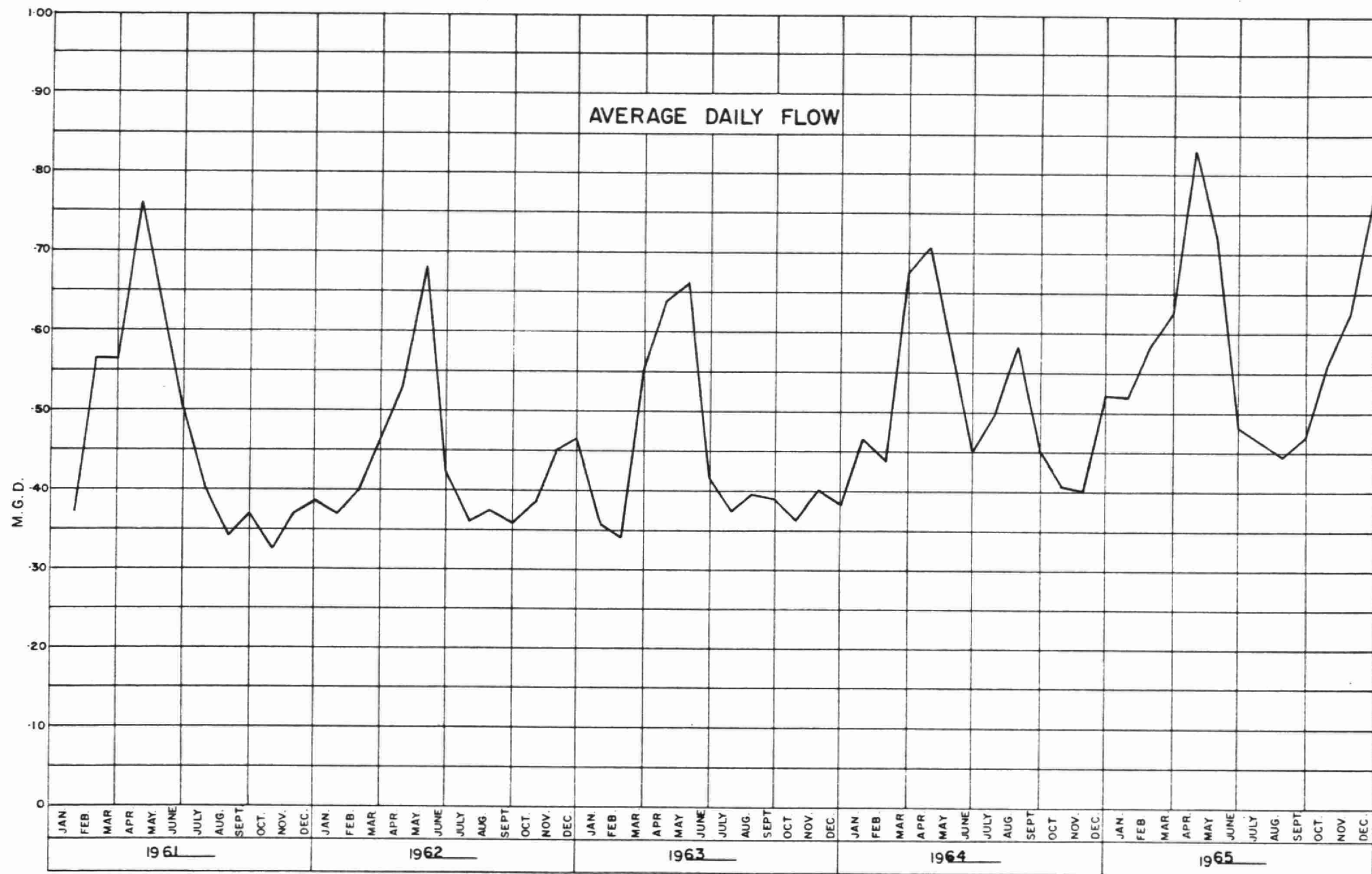
Process Data

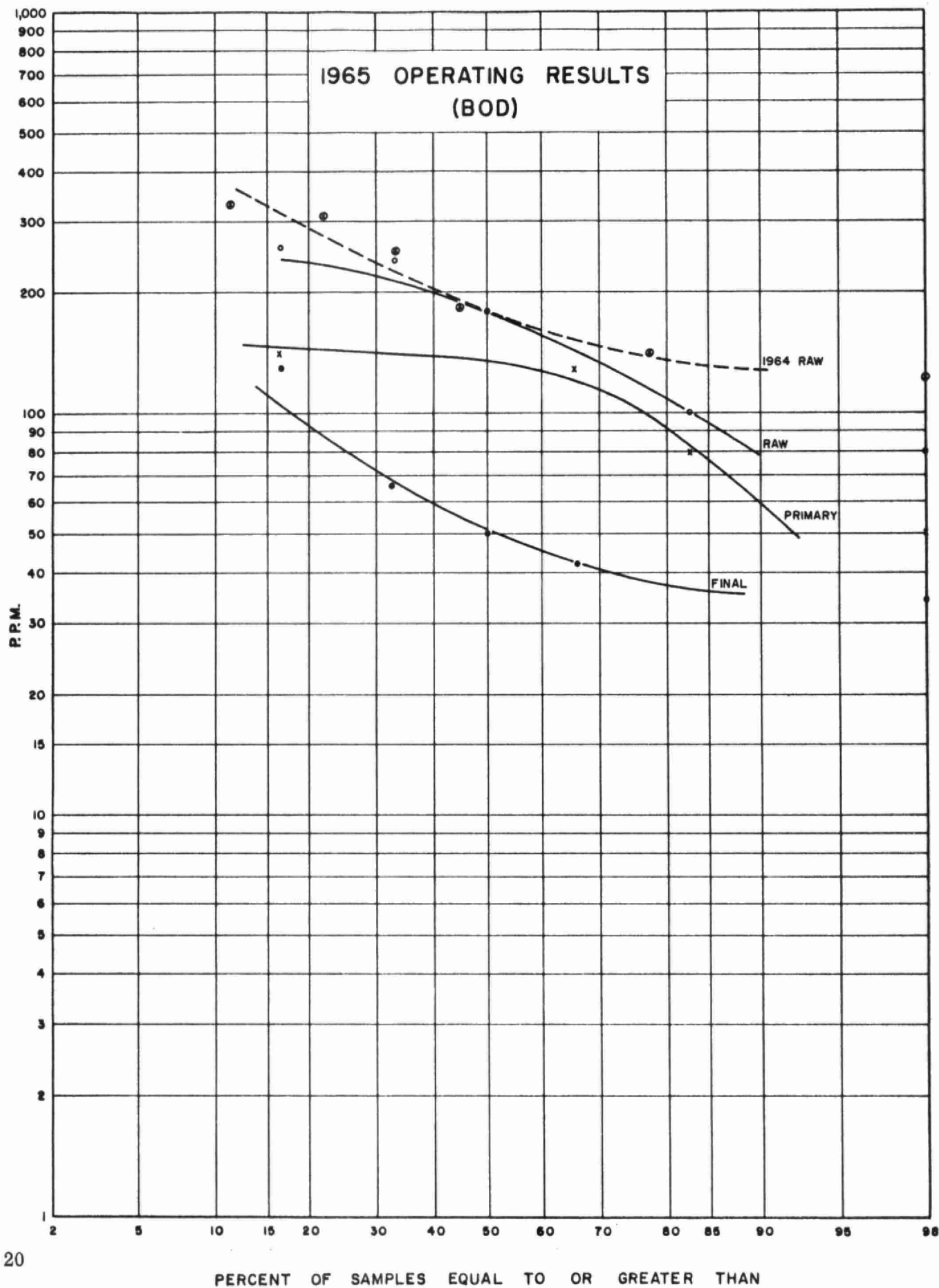
The average flow for 1965 was 0.593 mgd, 15.4% more than 1964, which was in turn 18% more than 1963. The flow has increased 36.2% over the past two years. From the probability graph it may be seen that daily design flow is exceeded one day in five. This fact strongly indicates the need for a plant enlargement.

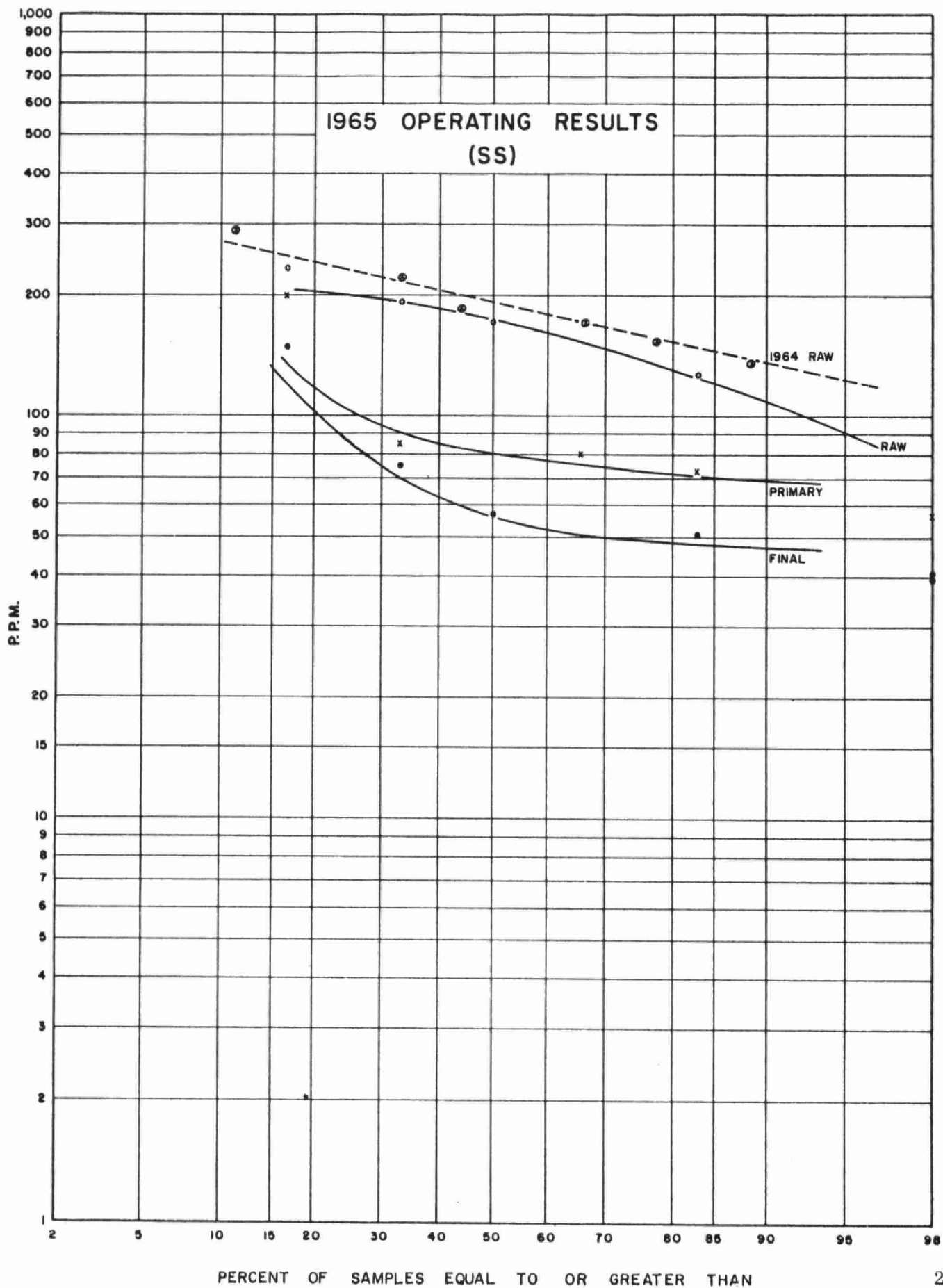
Since a large proportion of the plant flow received only primary treatment, the average BOD and SS of the final effluent are 61 ppm and 71 ppm respectively, well in excess of the OWRC objective of 15 ppm.

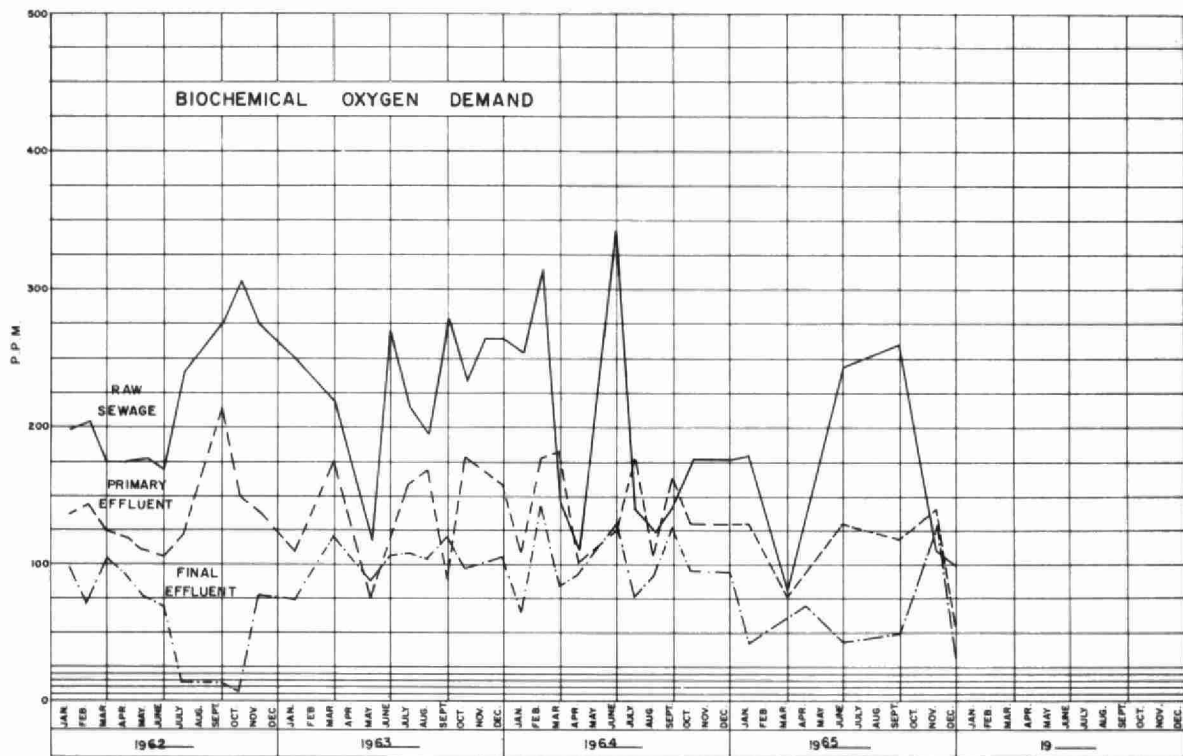
The concentration of BOD and SS in the effluent has been high for several years. A plant expansion was originally considered for 1966, but as of December 31, 1965, no definite expansion program had been established.



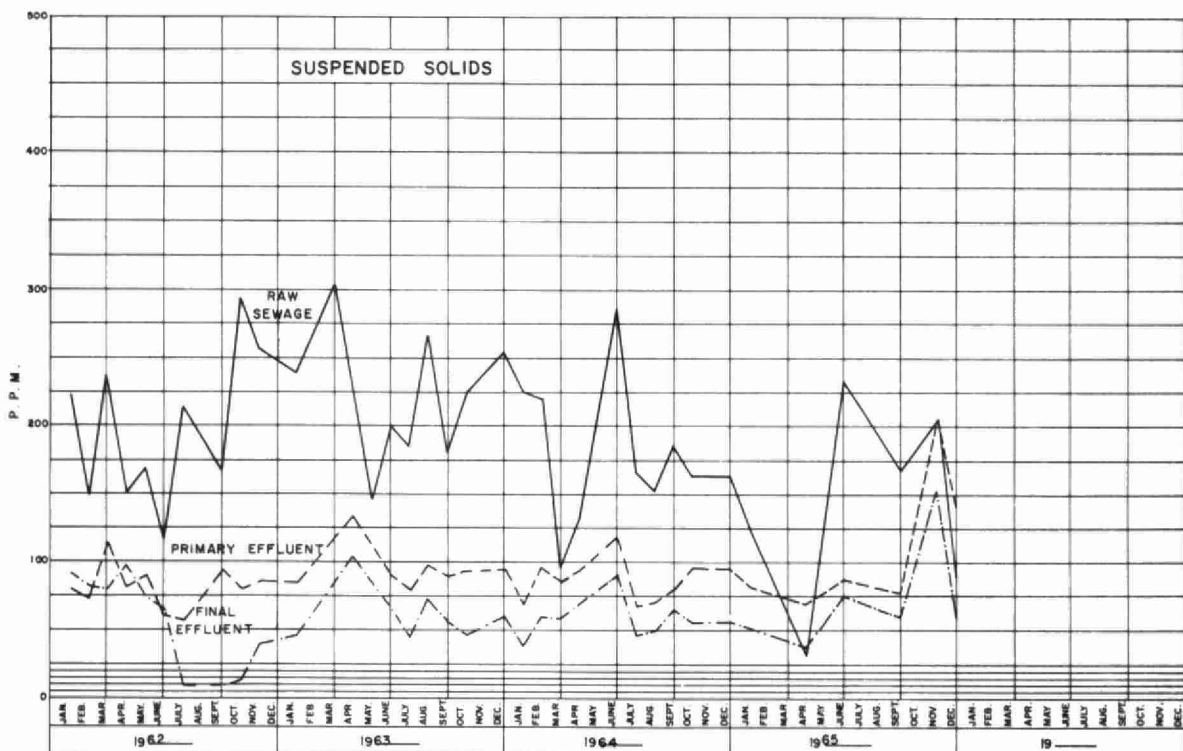








MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	
JAN.	180	42	76.5	11.1	125	51	59.0	6.0	8
FEB.	* 162	61	62.5	8.2	* 150	71	52.5	6.5	184
MAR.	* 162	61	62.5	9.8	* 150	71	52.5	7.7	76
APR.	78	70	10.0	1.0	30	37	0.0	-	44
MAY	162	61	62.5	11.3	* 150	71	52.5	8.8	204
JUNE	245	38	84.5	15.0	238	74	69.0	11.8	44
JULY	* 162	61	62.5	7.2	* 150	71	52.5	5.7	53
AUG.	* 162	61	62.5	6.9	* 150	71	52.5	5.4	96
SEPT.	260	49	81.0	14.8	166	58	65.0	7.6	68
OCT.	* 162	61	62.5	8.7	* 150	71	52.5	6.8	64
NOV.	110	128	+16.5	0.0	203	150	26.0	5.0	60
DEC.	100	37	63.0	7.5	138	54	61.0	10.0	40
TOTAL	-	-	-	109.0	-	-	-	85.3	941
AVG.	162	61	62.5	9.1	150	71	52.5	7.1	78

* average values substituted. No sample received.

COMMENTS

Percentage reduction of BOD and Suspended Solids are respectively 62.5 and 52.5. These facts point out the overloaded condition of the plant. A normally loaded plant of this type would be expected to give BOD and Suspended Solids reduction of 90% or greater.

It should be noted that this plant removes a considerable amount of grit. This is due to the high percentage of combined sewers which deliver both sanitary and storm waste water to the plant.

The heavy grit load causes operating difficulties. Problems are found particularly in difficult wet well maintenance and high costs for raw sewage pump maintenance.

AERATION SECTION

MONTH	PRIM. EFFL B.O.D. PPM.	MLSS. PPM.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. BOD. REMOVED
JANUARY	130	1658	17	1452
FEBRUARY	-	1860	-	-
MARCH	-	1663	-	-
APRIL	76	1452	11	2483
MAY	-	1276	-	-
JUNE	130	1654	17	1538
JULY	-	1580	-	-
AUGUST	-	1768	-	-
SEPTEMBER	128	1669	16	1593
OCTOBER	-	1386	-	-
NOVEMBER	140	1404	-	-
DECEMBER	54	1457	-	-
TOTAL	-	-	-	-
AVERAGE	110	1569	15	1766

COMMENTS

The load on the aeration section of this plant has been reduced from 25 to 15 lbs per BOD per 100 lb. of MLSS . This remains within the normally accepted limits of good practice and has resulted in improved efficiency of the aeration section. The aeration tank because of its inadequate size, receives only 0.2 mgd or approximately 33 percent of the average daily flow. Although operated to obtain the best possible effluent the small flows treated in this unit have no significant effect on the final plant effluent.

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU. FT.	% SOLIDS	% VOL. MAT.	1000'S CU. FT.	% SOLIDS	% VOL. MAT.	
JAN.	8.94	-	-	3.68	-	-	-
FEB.	7.57	-	-	5.16	-	-	-
MAR.	8.36	-	-	2.21	-	-	-
APR.	8.36	1.81	0.96	2.21	-	-	-
MAY	8.94	1.61	0.95	4.42	-	-	-
JUNE	8.65	-	-	3.68	-	-	-
JULY	8.08	-	-	4.79	-	-	-
AUG.	8.94	-	-	4.79	-	-	-
SEPT.	8.65	-	-	4.42	-	-	-
OCT.	8.81	-	-	7.00	-	-	-
NOV.	8.65	-	-	3.68	-	-	-
DEC.	8.94	-	-	3.32	-	-	-
TOTAL	102.89	-	-	49.36	-	-	-
AVG.	8.57	1.71	0.96	4.11	-	-	-

COMMENTS

The digester at the Orangeville plant is unheated. There is therefore, very little digestion particularly in the winter months. Volume reduction is obtained by allowing the sludge to settle in the digester and removing excess liquid (supernatant) and re-turning it to the wet well.

Average volume reduction from 1965 was 52%. This is excellent performance from an unheated digester.

The thickened sludge from the digester is trucked away in 22,000 gallon tank trucks at a cost of \$1.92 per cubic yard. Total hauling cost in 1965 was \$3525.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	16.128	1049	6.50
FEBRUARY	16.347	974	5.96
MARCH	19.441	1081	5.56
APRIL	24.919	1060	4.25
MAY	22.338	1079	4.83
JUNE	14.448	1007	6.97
JULY	14.362	1092	7.60
AUGUST	13.753	1079	7.84
SEPTEMBER	14.056	1079	7.68
OCTOBER	17.311	1082	6.25
NOVEMBER	19.066	1090	5.72
DECEMBER	23.684	1135	4.79
TOTAL	215.853	12807	-
AVERAGE	17.988	1067	5.93

COMMENTS

The chlorine dosage rate of 5.93 parts per million has been reduced from 6.67 parts per million in 1964. This is in part due to the reduced final effluent BOD from 101 ppm to 61 from 1964 to 1965.

This dosage rate is normal for a plant with this high final effluent BOD.

An average dosage rate of 5.93 ppm was needed to provide a chlorine residual in the final effluent of 0.5 ppm after 15 minutes. A chlorine residual is necessary to reduce the coliform bacteria count.



CONCLUSIONS

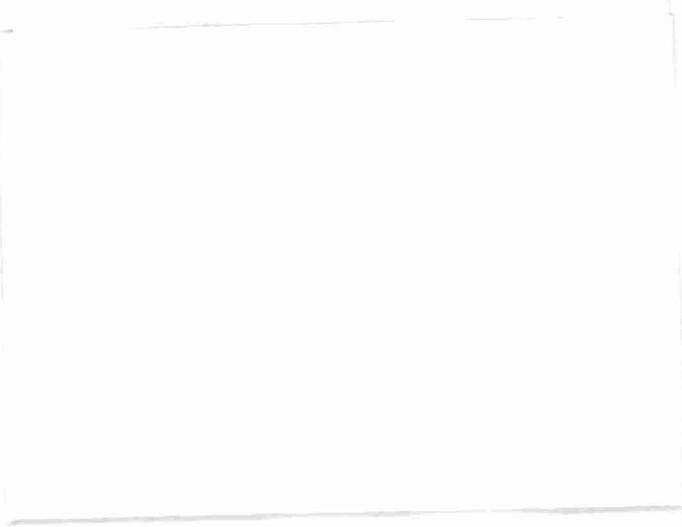
The Orangeville plant was grossly overloaded in 1965 and produced an unacceptable effluent by OWRC objectives.

The plant operation was satisfactory in that the effluent produced was as good as could be expected from an inadequate plant. All other phases of operation, including sludge disposal and chlorination were carried out efficiently.

Large quantities of grit caused operating difficulties at this plant.

RECOMMENDATIONS

The Orangeville plant capacity should be increased to treat the flow from the Town of Orangeville adequately. Further steps should be taken to separate storm sewage from sanitary sewage. This action would also alleviate high grit content problems.

A large, empty rectangular box with a thin black border, occupying the lower half of the page. It appears to be a placeholder for a drawing or additional text.

